Space Weather Forecast

Issued on Monday, 06 November 2023 at 01:23 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/G2 Minor/Moderate geomagnetic storms expected and chance of G3/Strong storming early 06 Nov due to ongoing coronal mass ejection influences. Chance of Moderate class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate, with two Moderate class flares originating from AR3480 in the southeast quadrant. There are seven sunspot regions on the visible disc. AR3477 in the southeast is the largest region, it remains relatively stable. AR3480 following shortly behind in the southeast appears more complex. The remaining regions are either small and simple, or difficult to analyse, including AR3472 and AR3474 which are on or near the western limb, these spots were more complex during their transition across the solar disc and still appear as bright flux regions. No recent coronal mass ejections are thought to be be Earth directed.

Solar Wind / Geomagnetic Activity: Solar winds at L1, showed ongoing enhancement from 04 Nov coronal mass ejection arrival, as well as two further coronal mass ejection arrivals on 05 Nov. The first coronal mass ejection on 05 Nov is thought to be that which left the Sun on 02 Nov, this resulted in an increase of speeds to 420 km/s at 05/0813 UTC, followed by the larger coronal mass ejection from 03 Nov which resulted in an increase to 503 km/s at 05/1224 UTC, with a secondary peak of 533 km/s at 05/2225 UTC. Total interplanetary magnetic field strength (IMF) was initially moderate, before rising to strong from 05/0810 UTC, with a peak of very strong around 05/1152 UTC as the second of the two coronal mass ejections arrived. The north south-component had two prolonged strongly negative periods between 05/0833 UTC and 05/1802 UTC, though has declined or become positive toward the end of the period. Geomagnetic activity was Quiet to Unsettled (Kp 2-3) initially before two G2/Moderate storm (Kp 6) periods from 0900 UTC, followed by two G3/Strong storm (Kp 7) periods from 1500 UTC, with a final G1/Minor Storm (Kp 5) period from 2100 UTC.

UK Aurora Analysis: Aurora was observed across Scotland, clearly visible from Shetland webcams, and sightings reported across some central and eastern parts of England on 05 Nov.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained close to background levels with no solar radiation storms observed.

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Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate solar activity is expected, with chance of isolated M-class flares mainly from complex region in the southeast quadrant.

Solar Wind / Geomagnetic Activity: Following the coronal mass ejection arrival on 04 Nov, there were two further coronal mass ejection arrivals in the last 24 hours. Continued effects are expected to continue into 06 Nov. Solar wind speeds are expected to mostly ease through the 06 Nov, with a chance of further varied enhancements, perhaps back to strong. The next forecast enhancement will likely be of the high speed stream from a coronal hole late 06 Nov or 07 Nov. Elevated speeds would then be likely to persist into 08 Nov.

Geomagnetic activity is forecast to be around G1/Minor storm or G2/Moderate storm with a chance of isolated G3/Strong storms early on 06 Nov due to the recent coronal mass ejection arrivals. Activity is likely to ease later 06 Nov and possibly into 07 Nov, but this may be then enhanced due to the onset of the high speed stream from a coronal hole, possibly giving further G1/Minor Storm intervals late 06 Nov or on 07 Nov. No further geomagnetic storms are expected from 08 Nov.

UK Aurora Forecast: Aurora may be observed across much of Scotland, along with Northern Ireland, northern England and perhaps down across the Midlands and much of Wales for the night of 05 Nov into 06 Nov.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to persist at around background with no solar radiation storms occurring.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	70	40	20	10
Strong	G3	No	30	1	1	1
Severe	G4	No	5	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	40	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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